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Emergence of the Cybernetic Art Matrix

The Story of the Grid

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Perhaps, the most unifying fact, that W. Ross Ashby reveals in *An Introduction to Cybernetics*, is that "every transformation can be shown as a matrix" (Ashby, 1957, p. 15).

As touchstones in the story of the grid and the history of modern art, three seminal artists, Piet Mondrian, Isamu Noguchi and Andy Warhol, are significant predictors of the emergence of Ascott's *cybernetic art matrix* (Ascott & Shanken, 1973). This matrix revealed itself through time vividly in the work of these three major icons of modern art, artists who are geographically linked by New York City. Piet Mondrian and his paintings manifest the ideals of *De Stijl*. The modular component stone sculptures *To Love* and *Kouros* by the Japanese American sculptor, Isamu Noguchi articulate a semiotic symbol system with a grid underneath. Andy Warhol's *Time Capsules* and *Shadow Paintings* are examples of cybernetic output as the scholar Tan Lin (2014) argues. These three figures and their archetypal works of art encapsulate the emergence of the cybernetic art matrix as a dominant vision and their legacy of systemic works of art are major illuminating contributions and dynamic milestones of achievement in the timeline of the story of the grid in modern art.

Beginning with the work of Piet Mondrian, I argue that the painting *Broadway Boogie Woogie* (1943) is an early realization of the cybernetic art matrix as its interdisciplinary title implies. The painting is not only an abstract representation of urban rhythmic dance in dynamic motion but also fundamentally, a geographic map of a system of coordinates that unify, distill and depict an aerial view of the landscape of New York City, inspired by *De Stijl*. This iconic painting lays the ground rules for a method of visualization of space and time featuring interdisciplinary translations that enable a myriad of possible implied solutions in multiple dimensions.

To truly comprehend the importance of *Broadway Boogie Woogie* we must trace its history and visual context in time. The painting is a square. A square is a simple

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shape with four equidistant sides and four corners, each at ninety-degree angles. It is deceptively simple, however, when you look at it as a cell. Think of pixels. Each point of light is a square. When you zoom into to a digital image, you can perceive the image as a system of squares. When you look at it in detail, you begin to see the building blocks of the visual world. They form a grid, a matrix. The first incarnation or experience with the network occurs in the flat realm, the second dimension. The grid's two-dimensional characteristics, coinciding with our early childhood development of mastering the motor skills of writing and drawing and imagining, something more than graphic design, connote the idea of modulating, planning, structural visualization in two-dimensional space; it is drawing or writing. When did these two actions of writing and drawing become separate practices? The cybernetic art matrix begins to emerge with the addition to height and width, when we consider depth and the third dimension. By visualizing the inherent depth of space, sculptural, architectural visualization in modular modeling, by solving the problematic notions of scope and scale, and then through the realization of actualizing the drawing, the blueprint, into the constructed forms of sculptural and architectural style, we begin to become aware of the grid as a kind of scaffolding container system, a matrix. As our awareness grows, we can consider the fourth dimension of time as a kind of musical data to fit on the staff, as cinematic synergy, as theatrical amalgam, as visualizations of time, like a heart monitor or the graphic equalizer tuned to the stock market. Now we can understand the dynamics of space and time and see the use of the cybernetic art matrix as a unifying force.

This simple image of a grid is so ubiquitous that it is almost invisible. The graph is a conceptual framework and a perceptual tool. It enables the visualization of complex phenomena in two, three and four dimensions. The matrix is a metacognitive tool to navigate, document and create useful works of art that balance form against content, and structure against spontaneity. All perceived phenomena exist within an abstract three-dimensional system of coordinates that contain reality. Think of this graph as a form of scaffolding, a three-dimensional array. It builds an infinite network of cubes that contain and enable us to imagine images, forms, and sounds in space and time. Consider the graph as an equalizer, the ultimate tool for conceptualizing complexity, and for curbing and containing chaos. The cybernetic art matrix is also useful as a map to envision a sustainable urban solution to a melting planet with a renewed balanced between both the natural and constructed environment.

In 9000 BC, the hand-built brick was invented as the original pixel, or *voxel*, that modular atomic form, a key fundamental unit of urban life as we know it. These cubic, rectilinear, modular units are the original building blocks. Then in 300 BC, the tablet was invented and historically represents the original surface where writing itself was created. The ancient letterforms of the Sumerian alphabet were designed on a grid, and formed the ancient structure of the infamous Ten Commandments, which still underpin our current legal structures and the concept of justice. The brick and the tablet, are both made of clay. The tablet is formed by when the clay is then rolled out flat to become the surface that contains the original text. The clay brick and clay tablet

form a conceptual bridge between language and architecture. Both the clay brick and tablet were invented within a grid and are concurrently both originally dynamic graphic systems. Curiously, in a quantum leap forward a new form of digital device shares the same moniker. Between 2700 and 2300 BC the first known calculator, the abacus, was invented in Babylonia or in China, as some historians assert (Georges, 2001).

The abacus is the first computer. Currently, on a nano-scale, computer scientists have invented a digital abacus that uses individual photons instead of beads and calculates mathematically at the speed of light (Feldman et al., 2017). In 2670 BCE, the grid is the underlying form that grew from the individual brick module metamorphizing into the map of the urban plan to become the layout the sub navigational structure of cities. Think of the longitude and latitude lines on a standard map. The grid is also a kind of orientation device.

The grid itself is the underlying substructure of many urban environments including the center of American culture, the infamous New York City. This structured urban environment owes its origin to the modular shape of the brick itself with its convenient hand-held design to build a myriad of urban environments that circumscribe the globe. Then in 120CE the map, the abstraction of the grid at its best, enables us to visualize space and understand it in two dimensions. A two-dimensional map is perhaps the most useful abstract art form. The implications of its invention on the mental landscape are profound. The ability to visualize three-dimensional space, to plan epic voyages, to measure vast distances, and to navigate space are all due to this grid of longitude and latitude. The grid's many uses and our dependence on it go mostly unnoticed or taken for granted (Higgins, 2009).[2]

The musical staff was created in 1025. It enables the invention of musical notation to plan the pitch, and the duration of sound. It allows the feat of miraculous and repeatable performances. Pulsing heartbeats, the rhythm of the rising and setting sun, the winds, tides, and currents revolve around a perceivable constructed system of order, the staff of life. In 1299, the ledger system of accounting and bookkeeping, which evolved into modern accounting was invented. This particular grid is the original inspiration for the software Microsoft Excel with its familiar spreadsheet environment comprised of cells, rows, and columns. Wealth is tracked, and capitalism is monitored on this ancient grid.

The perspectival grid was created in 1420, allowing the world to be perceived through the screen of *one-point perspective*. We see our world as if through a window, not unlike the modern picture plane that evolved into an image frame with which transformed our perception. Our visual framework has evolved into what we now accept the cinema, the monitor, the ubiquitous, omnipresent screen that now no existence can escape and captures the imagination and fascination of the masses (Higgins, 2009).

2. A great resource and serendipitous summary of my obsessions with all things related to the grid that I had been writing about since 1989 when I wrote my libretto for The Structure of United Imaginations; that was later published in *The Lone Star State of Mind*. 2009

In 1454 mass literacy becomes possible through the invention of the printing press and moveable type. The written word is given its wings. Moveable typeface set on paper within the confines of a grid frees the word from the auditory pulpit, allowing the audience to turn its attention to the printed page. This is the origin of the press.

In 1817, boxes—those multipurpose shapes with profound implications—were invented in England. Higgins notes several implications with artistic renderings. Andy Warhol hinted at the importance of the invention of the box with his enigmatic *Brillo Boxes* (Evans, 2017). He much later tried to capture all ephemera from his Midas touch in sealed boxes to make them capsules of time. Each poetic and historical time capsule is still preserved and worth a fortune in a metaphoric resonance of double entendres. Media of all kinds—including receipts, souvenirs, photos, cards and letters, party favors, newspaper clippings, and ephemeral data of the immediate moment of time—are preserved, captured as Pop Art that becomes encapsulated in a box.

1970 brings the invention of the net. The network of the minds of the twenty-first century and the data that guides us now is inextricably linked through the internet. The grid has become a term to describe a space, as in being off the grid. Grid computing is a systemic architectural digital networking system that is currently reinventing the structure of both database and content providers. Higgins manages to maintain an organic and lively style while documenting the trajectory of the grid from the early invention of the brick to the grid, the network, the matrix, the tablet, the moveable type, the map, the ledger, the screen, the box and now the internet. Higgins (2009) demonstrates with *The Grid Book* that through all its iterations and reinventions the grid is always relevant.

Norbert Weiner founded cybernetics in 1948 with the publication of the seminal work *Cybernetics*. Weiner defined cybernetics as "the scientific study of control and communication in the animal and the machine." The term *cybernetics* itself dates to ancient Greece, when Plato coined the term *kubernetes*, meaning to steer or to govern. *Kubernetes,* coincidentally, is the name of the software that the hegemonic giant, Google, uses to manage its data—a comprehensive container system of pods or cubes (https://cloud.google.com/kubernetes). This system of containers lends itself visually to Descartes's system of coordinates and the perspectival grid, and the framing device of the matrix later referred to as the cybernetic art matrix by Roy Ascott. In 1966, Ascott developed a systematic plan for the construction of a cybernetic art matrix, in which the computer was conceived of as: "a tool for the mind, an instrument for the magnification of thought, potentially an intelligence amplifier" (Ascott, 1966-1967/2003, pp. 129–130). For Ascott, the interaction of artifact and computer in the context of behavioral structure, is equally foreseeable, the computer may be linked to an artwork and the artwork may in some sense be a computer (Ascott, 1966-1967/2003). Ascott visualized the cybernetic art matrix as an integrating tool and platform for the interdisciplinary structure of the arts and rectilinear framing structures that govern the digital, cinematic and photographic realms. As our visual culture, is dominated by a series of frames for the pictures and containers for data in two, three and four dimensions.

The matrix mindset is a way of viewing the world through a historically modern lens of a kind of abstract cubic scaffolding. It enables the visualization in all four dimensions. The first dimension is height; such as the height of the Statue of Liberty or the Empire State Building for example. The second dimension is width and these two dimensions, height, and width, work in tandem to inform everything in the two-dimensional flat world such as a painting, drawing or architectural cartography. This system of coordinates is easily visualized in two dimensions as a simple map of Manhattan. Imagine the map of downtown Manhattan where coordinates are the point where two streets cross at right angles such as at the intersection of Forty Second and Broadway, for example. In the two-dimensional coordinate system of a typical subway map these coordinates are located where a train stops. These coordinates are situated at the corners of city blocks. With this system thoroughly ingrained in the average New Yorker's imagination, it becomes easy to navigate, visualize and imagine precisely where a visitor or inhabitant might find themselves in the city. This two-dimensional world is defined in squares, usually in square miles, like an area on a map bounded by a quadrangle of four coordinates like Times Square or Washington Square Park. However, two-dimensional scales can go down to a square inch, even down to a single pixel, which is a square unit of light in a digital photograph. Piet Mondrian distilled the vertical thrust of trees within the horizontal expanse of the landscape into the matrix point of view succinctly named *De Stihl* (Janssen et al., 2011).

The matrix helps the view to imagine three-dimensional space where the third dimension is one of depth. In the third dimension, the pixel becomes a voxel, a coordinate that can be plotted to model the third dimension in space. This dimension works in combination with height and width to form a cube. A cube features six sides, a top, bottom, front and back and right and left, simultaneously mirroring the shape of the human body as a unit of measure. As Leonardo DaVinci proposed in his *Vitruvian Man* drawing regarding proportions of the body and architectural component proportions:

> And just as the human body yields a circular outline, *so too a square figure may be found from it*. For if we measure the distance from the soles of the feet to the top of the head, and then apply that measure to the outstretched arms, the breadth will be found to be the same as the height, as in the case of plane surfaces *which are perfectly square*.[3] (emphasis mine)

Similarly a cubit is a modular unit of visualized measurement rooted in ancient times. But for our purposes currently, it enables us to visualize three-dimensional space regarding cubic feet. The matrix is the form that Sir Isaac Newton described as his vision of physical space, and it is the same one as Euclid's Geometry of an X, Y and Z axis, which corresponds, to height, width, and depth and Descartes's system of coordinates. The matrix is the only remaining constant form that does not change. We measure variations and changes in everything from rises and crashes in stock market

3. From "Ten Books on Architecture. Book III, Chapter I, "On Symmetry: In Temples and In The Human Body." Quotation retrieved November 26, 2018 from https://epo.wikitrans.net/Vitruvian_Man.

fluctuations and changes, which are monitored closely on a graph, to the musical notation of the rising and falling of octaves in a simple five-line and four-space graph, known as the musical staff. The matrix is a kind of GPS or orientation device that enables one to see and visualize space with a simple graphic, modeling as in a virtual gaming environment. Through the visualization of the fourth dimension of time, one can begin to plan and shape space and time like a theatrical choreographer plans movement through space and time on a stage. A matrix is a powerful tool of the imagination. This modeling or mapping has influenced the work of both Picasso and Braque's early Analytical Cubism, Malevich's Constructivism, Mondrian's De Stijl.

Structuralism was a French philosophical movement that categorized variables in human behavior anthropologically and postulated that all human behavioral phenomena are a systemic categorized language within a matrix. Lately, some would argue that this Structuralism Matrix and the American Cybernetic Matrix of thought represent the same form, for example, Céline Lafontaine proposes in *The Cybernetic Matrix of "French Theory.*"

> Could this be understood as a sign that the philosophical roots of French theory and the techno-scientific foundations of cyberspace are born of the one and same matrix? Not only would this allow a paradox to be solved, but also, even more significantly, it would unveil the kinship between "French theory" and postwar America. [4] (Lafontaine, 2007, p. 29)

The grid is a global cosmopolitan structural underpinning that enables principles from both the East and West to coalesce and amalgamate into an exemplary modern sculptural iconography as in the work of the Japanese American Artist Isamu Noguchi. His is a vision connected with forms such as the calendar, a map, the periodic table, architecture, digital photography, computer graphics, the multiplication table and also the Chinese and Japanese classical calligraphic writing system called Kanji, where a fix formation of strokes form a character that means or signifies a concept, encapsulating an idea. Isamu Noguchi was intimately aware of the matrix and it conceptually guided and governed parametrically everything that took shape in his career. From his early days with Renato Rotolo at the Leonardo School in New York his vision continued to inform his utopian playscapes for children and his UNESCO Garden spaces and garden installations. The matrix of architectural and sculptural design is the basis of his iconic *Red Cube* on Wall Street and the substructure of his sunken sculpture garden at the Yale University library.

The matrix enabled Noguchi, as the master sculptor and visionary architect, to devise his museum in Long Island City—both an interior and exterior spaces—with his sculptures in stone, which tease and almost defy gravity. Noguchi challenged the definitions of sculpture and architecture and the intersection of the two disciplines and where those distinctions meld and become one, such as in his environmental

4. I found this essay stitches together many concepts and historical theories and amalgamates them into one cohesive notion about the Cybernetic Matrix and aligns them historically, and philosophically as a foundation for visual Art and interpretation of the contemporary world.

landscape in Houston called *Sculpture for Sculpture*. Isamu Noguchi and his ideal playgrounds and parks of love seek to reconcile and to redeem his childhood memories. He aimed to make playscape spaces of the future where children gather an inclusive whole environment. Noguchi sought to realize these spaces in all four dimensions of height, width, depth and time for future generations to come together in his gardens and playscapes of creativity and social unity. "Everything is sculpture. Any idea, born into space, I consider sculpture"(Noguchi, 2004, p. 26).

The cybernetic art matrix enables the idyllic visualization of three dimensional forms into manifestations in space as realized sculpture. When Isamu Noguchi built biomorphic sculptural pieces, he revealed the intimate qualities of modular systems that have governed the cosmos since the dawn of time. He saw—simultaneously, presciently and evolutionarily—in the future of space and time, a Utopian Earth as sculpture. He chose the most high-tech, advanced, industrial tools with the oldest, most fundamental material to create work that depicts the most intimate, universal relationship in abstraction, a private code of the components of human sexuality. Noguchi reimagined these intimate components as sculpture on a monumental scale. He chose the most potent permanent material: stone, on a large-scale. Flat slabs, like puzzle pieces, pink Travertine marble in biomorphic shapes are a modernist code for bodies fit together playfully in carefully yet precisely balanced fragile, spatially-articulated configurations. One example is the component sculpture entitled *To Love* from 1971.

Black sections are fused into pink marble, quarried modules of a cored ring of stone that remain elusive and intriguing many decades after its conception. It is no accident that the juxtaposed marble components are often pink and black marble. The timeless example of *Downward Pulling #2* from 1972 demonstrates this modular component laminate use of Spanish Alicante pink marble juxtaposed against Marquina black marble to form a slow spiral opening ring. The stone itself as medium carries within it a severe and permanent tone. Isamu Noguchi said, "For me, it is the direct contact of an artist to material which is original, and it is the earth and his contact to it which will free him of the artificiality of the present and his dependence on industrial products" (Noguchi, 1985, p. 11). This systemic, cybernetic holism, this love of our planet in perpetual motion sustains us as we struggle to protect her moving forward into a new world without the art object of pure thought. We are developing and evolving into a new world of intuitive knowledge networks interconnected through pure thought. Ideally, the cybernetic art matrix will encircle the globe manifesting a sustaining planetary community matrix of longitude and latitude lines of a collective of creative minds linked together in peace through the stars in the satellite sky. Noguchi saw the earth as sculpture and his sculpture as a legacy left in the planet itself as part of the space and time continuum. Noguchi's art reaches both into the past of primordial creation and into the future of a harmonious unity where the planet and its remaining inhabitants come together to heal. Noguchi's vision realized in stone and paper seeks to re-establish equilibrium and balance, systemically, holistically, and cybernetically contained within a three-dimensional matrix of timeless space.

An architectural intelligence coupled with a playful use of color and composition opens the metaphor of the cybernetic art matrix (Ascott & Shanken, 2003). Mondrian crystallized and manifested all its rich applications as early as *Broadway Boogie Woogie* in 1943. Five years later in 1948, Norbert Weiner would publish his seminal work *Cybernetics*. In 1957, W. Ross Ashby wrote his groundbreaking *An Introduction to Cybernetics.* Cybernetics is a methodology to map and understand change. It mirrors the mind and the machine as complex systemic devices. Cybernetics is a useful formal linguistic vocabulary for understanding the complexity and varying states of transformation.

In "Paragraphs on Conceptual Art" 1967, Sol Lewitt distills the variable parts of Conceptual Art down to the components of intuition. Lewitt conceptualized a three dimensional grid and explored in depth the cube and its multiple faceted resonance as a meaningful art form. "The idea becomes the machine that makes the art" (Lewitt, 1967, p. 1). This concept is particularly relevant because it is not the actual resulting material object of a grid whether realized in two or three or including time, four dimensions that is the crucial piece of the art. It is the metadata, the idea, the concept and how it changes our inner mindscape as a tool of visualization and imagination skills informing an *Architectural Intelligence*, which Molly Wright Steenson (2017) describes as the vital piece to take away and apply to our everyday lives. This visualization of space built of modular systemic components as manifestations of cybernetic output is the foundation of Warhol's Shadow Series (Lin, 2014).

Tan Lin describes the "Shadow Series" by Andy Warhol as computational output and the synesthetic act of painting as a machine. Logic and pleasure are synced electronically. The disco track and the strobe provide a flash of an idea that is automatically generative and pleasurable, high pitched and ephemeral as in, the moment of right now (Lin, 2014). Lin unveils a cybernetic artist of resonance within a matrix through his interpretation of "The Shadows" series that revitalizes the oeuvre of Warhol and makes it relevant again. Warhol embodies the cybernetic art matrix and demonstrates its enduring relevance. Each canvas in "Shadows" can be viewed as a cybernetic output as a frame or a single container of data, a slide, a cell. Each canvas is an identical photo-synthetic silk-screened frame depicting a single repeating moment, a flash of a strobe against a mysterious triangular shadow that suggests an interior space of perhaps a box of some kind. The brightly colored canvases, are each one unique in the color scheme and of high contrast to each subsequent iteration composed on a graph like musical notes on a staff. These canvases can be viewed as measures of an operatic melody conceived in sync with a disco beat in celebratory colors that gyrate and pop, leaving an afterimage that seems to pulsate on the back of the viewers' eyelids.

Andy Warhol's "The Time Capsules" series transformed ephemera of the moment into artifacts worth examining, not alone, but in contrast with one another and groups them, with their respective capsule, cell, or frame, thereby bringing the idea of the cybernetic art matrix into high relief. Rows and columns of identical boxes were carefully dated and stored in a sequence containing the personally selected ephemeral,

temporal, or representative objects of the moment such as photographs, souvenirs, gifts from celebrities, receipts that capture events, gifts, newspaper clippings, mail, and a myriad of other objects of memory. The time capsules are a formal realization of the cybernetic art matrix just like a Japanese Kanji character of a fixed number of strokes within a perfect square; these capsules are the foundation of Warhol's inner language of thought.

Oxford defines the word *grid* as a framework of spaced bars that are parallel to or cross each other.[5] One example of a grid could be merely a network of lines that cross each other to form a series of squares or rectangles, as in a grid of tree-lined streets, a network of cables or pipes for distributing power, especially high-voltage transmission lines for electricity. Grids are most often a network of regularly spaced lines on a map that cross one another at right angles and are numbered to enable the precise location of a place. The word grid also now represents some computers linked together via the Internet so that their combined power may be harnessed to work on challenging problems.[6] Metaphorically speaking, grids could function as connective tissue for humanity. The terms *matrix* and *grid* can be used synonymously, yet matrix has more associations with mathematical modeling and digital code connotations where a grid is a more descriptive term that might express the concept of rows and columns of lines crossing at equidistant right angles. For example, in the following illustration by inventor and architect, Buckminster Fuller, the function of the grid is an invention, tool or artifact of amalgamation that results in a synthesis of culture, art, and consciousness:

> I always try to solve problems by some artifact, some tool or invention that makes what people are doing obsolete so that it makes this particular kind of problem no longer relevant. My answer would be to develop a world energy grid, an electric grid where everybody is on the same grid.[7] (Fuller & Brenneman, 1984, p. 135)

Thus, Fuller's statement helps us to see the world as one place, "where everybody is on the same grid." Applying this same logic to art and the role of grids in works of art, such as *Broadway Boogie Woogie* completed in 1943, by Piet Mondrian. I contend that the grid is the structure that shapes our thoughts and tempers our emotion. From this perspective, the matrix mindset is the realization that a grid is the ultimate framing device, the underlying structure of art. Consequently, grids in works of art, as in Fuller's illustration, become a connective tissue serving to bring humanity together. Indeed, the narrative history of the grid as the ultimate framing device is promulgated in the work of writer and scholar Dr. Hannah Higgins. Dr. Higgins reframes the

5. Oxford English Dictionary, "Grid" April 1, 2016, http://www.oxforddictionaries.com/us/definition/american_english/grid
6. Oxford English Dictionary, "Grid" April 1, 2016, http://www.oxforddictionaries.com/us/definition/american_english/grid
7. I found this quotation particularly appropriate. I was first introduced to the work of Buckminster Fuller through the performance artist, Laurie Anderson's seminal work entitled: United States. Then later, curiously, I discovered a connection between Fuller and Isamu Noguchi, who were friends. Most recently I found out that my relative Kenneth Snelson had studied under Fuller as a professor at Black Mountain College.

narrative history of the grid as ubiquitous, an underlying matrix of cognition that extends infinitely into the past, present and future, one that represents an underlying principle of our world. She plumbs its origin from ten particular points. She traces the trajectory of the grid from the early invention of the brick to the graph, the tablet, the moveable type, the map, the ledger, the screen, the box and now the internet. "The experience of chaos requires an organizing principle, a frame of reference through which it is perceived as chaotic relative to something that is not. What's less chaotic than the standard, orderly, ordering grid?" (Higgins, 2009, p. 257). Thus, through Dr. Higgins" historical analysis, we come to understand that grids are a framework through which both emotions and works of art can play a meaningful role. For example, the painting *Composition II in Red, Blue, and Yellow* created in 1929 by Piet Mondrian can be processed and understood by the application of order to perceived chaos. Within this grid or matrix theoretical framework, it becomes evident that the square is not a subconscious form; instead, it is the creation of intuitive reason, as affirmed by the artistic invention of Cubism. Cubism, the face of modern art since 1907 is built from the component grid system comprised of cubes that are made of individual squares. The infamous creators of what was first named Cubism are historically the painters Pablo Picasso and Georges Braque located in Paris between 1907 and 1914 (Picasso & Ashton, 1996). The Cubist style was comprised of flattened, simplified two-dimensional surfaces of the picture plane, while it rejected the traditional techniques of the illusory three-dimensional perspective, the perspectival grid, in favor of depicting multiple points of view simultaneously. This type of cubism is in sharp contrast to the architectural rubric or matrix that governs both two and three-dimensional space cybernetically that was later unveiled by Mondrian. The constructivist Kazimir Malevich asserts that the square is a living, regal infant, the first step of pure creation in art (Malevich, 1916/1969).[8] The square is deceptively simple on its surface, as a cell or a pixel might be considered. However, each point of light in a pixel is a square, as evidenced by zooming into a digital image, where the digital pixels are a system of squares. Thus, upon closer inspection, the building blocks of the visual world in the art form of digital imagery that appear when zooming into the image of a graphic image or digital photograph, reveal the pixels themselves as a grid.

This simple structure, the network of the grid, is so ubiquitous that it is practically invisible from the viewpoint of the image at a holistic level is a kind of map or orientation device for rational, measured, perception. Likewise, the graph is also a conceptual framework and perceptual tool. It enables the visualization of complex phenomena in two, three and four dimensions.

Albert Einstein viewed graphs in the following manner:

> Every description of the scene of an event or the position of an object in space is based on the specification of the point on a rigid body of reference with which that event or object coincides. This

8. I found this discussion about the square as the original starting point of intuitive creativity or square one to be personally significant.

> applies not only to the scientific description but also to everyday life...In the physics of measurement, this is attained by the application of the "Cartesian system of coordinates." This consists of three plane surfaces perpendicular to each other and rigidly attached to a rigid body. Referred to a system of coordinates, the scene of any event will be determined (for the main part) by the specification of the lengths of the three perpendiculars or coordinates (x, y, z) which can be dropped from the scene of the event to those three plane surfaces. (Einstein, 1920, p. 7)[9]

Essentially, Einstein believed that all observed phenomena exist within an abstract three-dimensional system of coordinates that contain reality. According to this idea, the graph forms a scaffolding or a type of three-dimensional array. This view provides an essential grounding for the role of structure in both life and art as crucial, as an orientation device for both humanity and creativity. Einstein's theory augments the viewpoint that grids serve as a framework that facilitates the translation of subconscious thought and emotion into a streamlined system of interpretation for cognitive perception. In this sense, grids are a map for the geography of the mind that allows the simultaneous contemplation of many facets of meaning, as evidenced in science, art, and architecture.

An example of how this matrix mindset works can be found in the work of painter Piet Mondrian. Mondrian's meditation on art through painting and reductive geometric abstraction distilled the essentials of the picture plane into strictly vertical and horizontal configurations with the only subject within the frames of black consisting of the primary colors reduced to their pure essence (Mondrian, 1986).[10] This work is not painting the mere surface or reflecting life, instead it simplifies and distills life in meditation. What results is a new visual language which communicates a conscious vision of interrelationships most useful to the viewer.

Consequently, the squared canvas itself becomes an object of art, synthesizing color and form through a hybrid of both painting and sculpture such as in his 1929 work *Composition II in Red, Blue, and Yellow.* As a result, this form holds together metaphorically the manic jazz of contemporary life in all its *Broadway Boogie Woogie* and flamboyant colorful brilliance. Basically, in Mondrian's work, we see a digital array in two dimensions that captures the essential elements of time and space in a manner so absolute that the success of these results and their iconic qualities do not change and are, therefore, timeless.

Thus, it can be argued that Mondrian created the synthesis of art and life in contemporary culture through the elimination of a strict boundary between life and art. He achieved this feat using bold grids in an experimental framework essentially predicting modern perception. In his painting *Broadway Boogie Woogie*, for example, we see that the austere black gridlines which usually function as parametric absolute boundaries have been replaced. In this break through point of departure, using joyful, bright yellow stripes which divide the picture plane—like a map of New York City—into streets or subway tracks. Within narrow yellow brick roads there are bright

9. The short chapter on "The System of Coordinates" in this book resonates with my vision of art and life.
10. This book is a treasure of Mondrian's thoughts and creative process. The passages where he interviews himself as X and Y and answers his own questions are particularly revelatory.

crimson red, and pure cobalt blue squares that appear as if they might be representing codified people, or vehicles moving along the systemic quadratic array of yellow stripes. These linear elements seem to evoke the idea of a city with its streets in motion as if it were the scenic routine of the daily life of a New Yorker. The painting is in and of itself a kind of song and ritual dance. It is much more than an abstraction of musical cybernetic data. The painting is a choreographed melody that echoes or repeats itself within a system of coordinates, a boogie woogie, an urban dance as seen from an aerial drone, helicopter, or bird's eye, in bright primary colors painted precisely within graph-like notes on a staff. Thus, the synthetic vision is a direct result of form and content. Piet Mondrian stated,

> Within this framework, it is wrong to think that the non-figurative artist finds impressions and emotions received from the outside useless, but rather regards them as necessary in order to inform his work and to challenge humanity to a new level of consciousness through a unified expression of experience and emotions based on the world in which we live. It is equally wrong to think that the non-figurative artist creates through "the pure intention of his mechanical process," that he makes "calculated abstractions" and that he wishes to "suppress sentiment not only in himself but in the spectator." (Mondrian, 1986, p. 87)

In order to visualize the geographic vision and dynamic cybernetic energy of *Broadway Boogie Woogie* as a contemporary graphic metaphor for life, consider the following example: a corporate accountant who spends his life analyzing information and data in an Excel spreadsheet. He then enjoys an escape or mental release from a Philip Glass solo piano via an mp3 format on his iPod as he rides home downtown on the rush-hour train in Brooklyn. His entire life becomes the visual gestalt of a unified whole. This is the essence of Art with a capital letter A. The Japanese industrial designer Naoto Fukasawa once stated, "Great design is a multi-layered relationship between human life and its environment."[11] (Fukasawa, 2017, p. 31)

In *Natural Reality and Abstract Reality: An Essay in Trialogue Form*, Piet Mondiran makes a prescient proposal:

> Thus, we must carefully distinguish between two kinds of reality, one which has an individual character, and one which has a universal appearance. It is, however, clear from this perspective that the non-figurative artist has not become a mechanic, but that the progress of science, of technique, of machinery, of life as a whole, has only made him into a living machine, capable of realizing in a clear manner the essence of art.[12] (Mondrian, 1986, p. 342)

This perceptual duality continues to penetrate experience for both the viewer and the artist. Jack Burnham stated in his book *The Structure of Art,*

11. The unity of design and life is a cornerstone of my vision, and this quote seemed in my view to sum it up precisely in laymen's terms.
12. This later became Andy Warhol's dream to be a machine capable of producing the essential art.

> If the essence of science, ethics, language, and ceremony is conceptual relationships, then the same might be true of art. Approached on this level, we must accept the possibility that art operates according to an unperceived and unconventional system of logic. (Burnham, 1973, p. 43)[13]

Reintegrating the artist into the culture will ultimately demystify the role of the artist. According to Jack Burnham, "If he understands his work and the fact that it no longer demands mystification, the artist can still be a tremendously valuable figure in society"(Burnham, p. 43).[14] In understanding the matrix mindset as the conscious awareness of the role that grids and matrices serve as a foundation for art, and which promulgates the artist's perception—thus enabling artists such as Warhol, Mondrian, and Noguchi—one can begin to discern that this model for the artist is informed by cybernetic theory, which supports awareness of new parameters and possibilities of art. This art will be an integral part of our experience maintaining our equilibrium and focus as progress pulls us into the new millennia. Mondrian's *Broadway Boogie Woogie* presciently manifested the emergence of the cybernetic art matrix. Isamu Noguchi's *Kouros* fused the cosmopolitan global principles of modern American sculpture with the ancient Japanese matrix and set it in stone. Warhol's *Shadow Series* realized a strobelit cybernetic disco output in high-contrast, brightly-colored paintings while his *Time Capsules* synthesized his art and life through the process of selection. These three iconic New York City artists, each in his own particular way, left a legacy of important seminal exemplary touchstones of art inextricably fused with the enduring resonant framework of the cybernetic art matrix and its critical role in the story of the grid in modern art.

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13. Maybe even more precise to say that art is reintegrating or reinventing itself and is now enmeshed so much so that we no longer make the distinctions as often as we once did in the past.
14. To demystify the role of the artist might in some minds make him or her obsolete in a sense and if reinvented still an immeasurable value to society. Burnham was a sculptor himself as well as an art historian.

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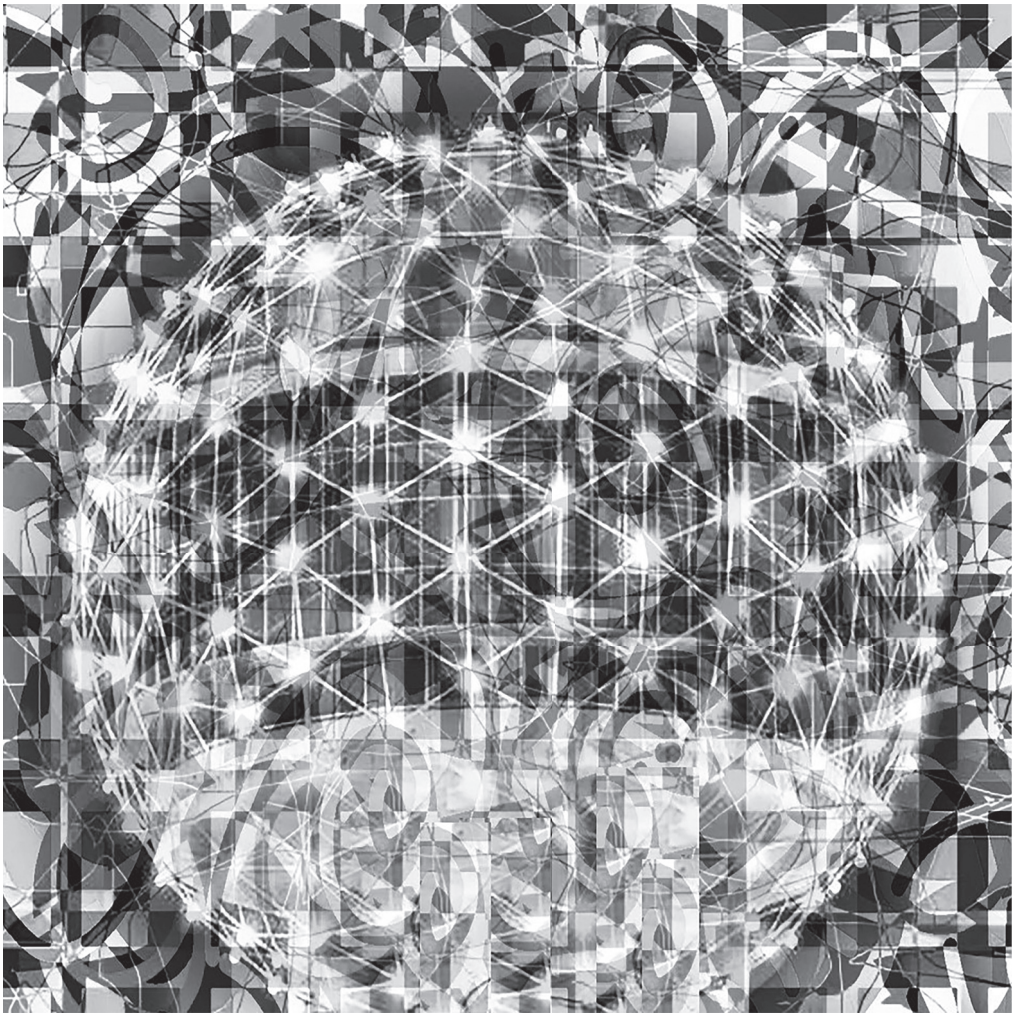

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